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The present invention relates to a device designed for housing and manually controlling an electric relay for protection against overloads of the thermal relay kind
10 associated with a contactor.

It is common practice to house in cases, such as cases for electric apparatus, switches protected against overloads and formed by the association of a contactor and a thermal relay.

15 It will be recalled that the contactor comprises a control electromagnet and defines the ON and OFF operation of a power load, for example a motor, as a function of the current which flows through the coil of the electromagnet. The thermal relay determines the stopping
20 of the motor, particularly in the case of an overload in at least one phase conductor of the motor ; for this, the thermal relay comprises a switch which is controlled by an opening mechanism sensitive to the deflection of bimetal strips in the case of overloads and which is disposed
25 electrically in series with the coil of the electromagnet of the contactor.

The opening mechanism must be resettable after each tripping operation. Depending on the type of thermal relay considered, resetting is either manual, or automatic, or
30 manual or automatic, by including in the latter case a manual-automatic selection means. Manual resetting is achieved by means of a push-button disposed on the front face of the thermal relay.

In addition, it is often necessary in a thermal relay
35 to be able to control manually the stopping of the contact-thermal relay assembly by means of another push-

button, also disposed on the front face of the thermal relay and acting on the opening mechanism for opening the switch.

5 When the contactor-thermal relay assembly is fitted in a case, a control push-button is provided on a front wall thereof, e.g. in the manner indicated by US patent 4 011 423. By pressing this button, an operator acts on the pushers for stopping and resetting the thermal relay. This stopping and resetting action is transmitted to the
10 pushers of the thermal relay by transmission means whose purpose is to transform the movement of the control push-button into a movement of the controlled pushers, while taking into account lost motion for application on the pushers and misalignment between the push-button and the
15 pushers of the thermal relay.

The purpose of the invention is to facilitate the mechanical transmission between the control buttons of a case housing a contactor-thermal relay assembly of the type described and the pushers actuating the thermal
20 relay.

Another object is to conveniently conciliate the presence of push-buttons mounted on the front face of the case with a relatively large between axis distance with the use of pushers connected to the thermal relay and
25 having a relatively small between axis distance.

Another object is to allow the user to operate either resetting of the opening mechanism of the thermal relay alone, or stopping - i.e. opening of the switch of the thermal relay - and combined resetting, using simple
30 and compact means.

To obtain these results, it proposes a device for housing and manually controlling a thermal relay associated with a contactor, the thermal relay comprising a box provided on a front face with a stop/reset push-
35 button, the device comprising a case provided on a front face with at least a push-button having a thrust element which comprises transmitting means actuated by the thrust element to operate the pushers of the thermal relay,

these transmission means comprising at least a transmission element having, on the one hand, a drive surface applicable on a pusher of the thermal relay and, on the other hand, a receiving surface on which may be applied the thrust element of the push-button, the transmission element being moveably mounted in a support fast with the box of the thermal relay.

According to the invention, said device is characterized in that

- 10 - the thermal relay has a stop and reset pusher, and
- the transmission means comprise two transmission elements, i.e. a stop lever having a drive surface which can be applied on the stop pusher and on which may act a stop push-button, and a reset lever having a drive surface which may be applied on the reset pusher and acted upon by the reset push-button, the stop lever being adapted for being applied on a portion of the reset lever in order to push in the reset pusher in response to actuation of the stop push-button.

20 Due to these provisions, the user may either reset or combine stop and reset. The drive surface and the receiving surface of each lever are positioned so as to generate the desired transmission ratio ; the stroke may thus be amplified, i.e., a stroke of the drive surface can be obtained which is amplified with respect to the stroke of the receiving surface.

30 The transmission levers are for example bars mounted for pivoting in bearings of the support, preferably so as to rotate about an axis parallel to the front face of the box of the thermal relay. Each lever has a surface which cooperates with a thrust element of a push-button and which is offset along the pivoting axis with respect to the position of the corresponding pusher. When the device comprises two push-buttons, two levers and two pushers, 35 the respective surfaces of the stop lever and of the reset lever are separated axially by a distance appreciably greater than the distance between the axes of the pushers.

There may then be a certain latitude in positioning relatively bulky push-buttons with the desired accuracy for actuating relatively small pushers.

5 The transmission support is for example a cradle having lateral interlocking and/or snap-fit conformations cooperating with complementary elements on the box of the thermal relay. The cradle advantageously comprises a front strip with openings coinciding with openings provided in the front face of the box for terminals of
10 the thermal relay, so as to leave the openings of the box free. The support may thus advantageously form at the same time a cover for protecting the terminals against touching. Pins for connecting the switch housed in the thermal relay with the coil of the contactor may be fixed
15 to the support, the latter being preferably pre-wired with the contactor before the thermal relay is fixed thereon so as to ensure coherence between the electric stoppping and the mechanical stopping.

The description of one embodiment which will now be
20 given with reference to the accompanying figures will better show the characteristics and advantages of the invention.

Figure 1 is a schematic front view of a case with a thermal relay in accordance with the invention, the front
25 wall of the case being shown with parts cut away ;

Figures 2 and 3 are corresponding cross sections through planes II-II and III-III ;

Figure 4 shows on a larger scale the detail A of the thermal relay of figure 2,

30 Figure 5 is a view of the thermal relay along arrow B of figure 4,

Figures 6 to 8 show the control of the thermal relay in the respective ON, resetting alone, or combined stopping and resetting situations,

35 Figures 9 to 11 show respectively in front, back and top views one embodiment of the support for the stop and

reset levers,

Figure 12 is an exploded perspective view of the support of figures 9 to 11,

Figure 13 shows a variant of the support in perspective.

The case 10 for an electric apparatus shown in figures 1 to 3 comprises a front wall 11 with two push-buttons, namely a stop button 12S and a reset button 12R. Buttons 12 are not shown in figure 1 because part of wall 11 has been cut away.

The case houses more precisely a contactor 14 mounted on a rail element 15 and a thermal relay 20 which is associated electrically with the contactor so as to protect the load controlled thereby against overloads.

The thermal relay 20 comprises a box 21 (see figures 1 to 5) and is fixed to the contactor by fixing means 22. Box 21 comprises power terminals 23 and power connection pins 24 adapted to be connected to terminals of the contactor.

On the front face 25 of box 21, a stop pusher 26S and a reset pusher 26R are provided which are urged towards their rest position by respective springs not shown. It should be recalled that the thermal relay comprises a switch controlled by an opening mechanism sensitive to the deflection of bimetal strips in the case of an overload and is disposed electrically in series with the coil of the electromagnet of the contactor. Pushers 26S, 26R act on the opening mechanism for respectively opening the switch and resetting said mechanism. With pusher 26R are associated selection means for selecting manual resetting by means of said pusher or automatic resetting.

Above the pushers 26 and opening on to the front face 25 openings 27A are provided for the screws of

terminals 27 for signalling or for connecting the switch with the coil of the contactor, and on a set-back portion of the front face openings 25A are provided for the screws of the power terminals 23 (figure 4).

5 Each push-button 12 has a thrust element 12a such as a collar or similar element (see figures 2 and 4) for acting on transmission means comprising a stop lever 30 and a reset lever 40, these levers being mounted for pivoting in bearings of a front support 50 fixed directly
10 by snap-fit and/or interlocking on the box 21 of the thermal relay 20.

Levers 30, 40 are mounted for pivoting about axes x-x, respectively y-y, parallel to the plane P of the front wall 25 and horizontal. The axes could possibly be merged.
15 As can be seen in figure 12, each lever 30 (40) comprises a horizontal bar 31 (41) to which a perpendicular arm 32 (42) is attached. The arm 32 (42) has at one end and on the same side as pushers 26 a boss 33 (43) which can be applied on the corresponding pusher 26S (26R).

20 Lever 30 (40) further has a boss 34 (44) preferably formed as a projection on bar 31 (41) on the same side as the push-buttons 12. The bearing zones of bosses 33, 43 and 34, 44 are provided so as to ensure a control stroke of pushers 26 greater than that of push-buttons 12, such
25 amplification being desirable to overcome the dispersion of the tripping strokes of the pushers. In addition, bosses 34 (44) are spaced apart by a sufficient distance for actuating, from bulky push-buttons 12 with a distance a between axes, pushers 26 having a small frontal area and
30 a much smaller distance b between axes. The distance considered may for example be close to a.

Lever 30 is adapted so as to have a drive surface 35 which can be applied on arm 42 of lever 40, for example on the back 45 of boss 43. Thus, actuation of the stop push-
35 button 12S causes the combined movement of pushers 26R, 26S. Surface 35 is for example situated on a set-back

portion of boss 33. This portion may possibly be divisible for the case where it might be desirable, in some apparatus, to actuate pusher 26R unequivocally by button 12R and pusher 26S alone by button 12S.

5 By the configuration of the bosses and of the levers, priority of actuation of one pusher over the other can be obtained. In particular, the reset pusher 26R may be driven in with a slight advance on the stop pusher 26S if the opening mechanism requires it. Levers 30, 40 are
10 recalled to their rest position by a specific spring or preferably by springs specific to the pushers 26. Support 50 has appropriate stops for the levers.

In the embodiment shown in figures 9 to 12, the support 50 for levers 30, 40 also serves as protective
15 cover against direct contact for terminals 27. Towards the front it comprises lugs 51 with bearings for the pivoting levers 30, 40 and a front strip 52 connecting the lugs together and having openings 53 coinciding with the openings 27a; thus, the fitting of support 50 at the front
20 of the thermal relay does not adversely affect the faculty of operating the terminals thereof.

Support 50 further has interlocking and/or snap-fit elements 54 (figures 12 and 13) cooperating with complementary elements 55 of box 21 of the thermal relay
25 for holding the support in position on the box.

Two connectors 56 are fixed to a horizontal surface 57 of support 50 intended to come under box 21; these connectors 56 are intended to penetrate and be clamped in some of the terminals 27 of the thermal relay so as to
30 provide, by means of conductors 58 connected to suitable terminals of the contactor, the desired series connection of the thermal relay switch with the coil of the contactor. It is advantageous for support 50 to be thus pre-wired with the contactor mounted in the case, the user
35 subsequently fixing a thermal relay of the desired power to the contactor, then fixing the support on the front of

the thermal relay.

Operation of the device described will be explained with reference to figures 6 to 8, assuming that the selection of the manual reset mode has been previously
05 made.

Figure 6 shows the "ON" state of the thermal relay 20. The thrust shoulders or collars 12a of the control buttons 12R, 12S are held pushed out in the direction of arrow C by the return springs proper to these buttons. Levers
10 30, 40 are held pushed out in the direction of arrow C by the springs of pushers 26R, 26S.

When the operator desires to effect manual resetting, he presses the push-button 12R whose collar is applied on the boss 44 of the reset lever 40. Boss 43 thereof is
15 applied on the reset pusher 26R which drives in and resets the opening mechanism of the thermal relay. During this operation, the stop pusher 26S is not operated.

When the operator desires to open the switch of the thermal relay manually, he presses the stop push-button
20 12S. The collar thereof is applied on boss 34 of the stop lever 30 ; the result is application of boss 33 of lever 30 on the stop pusher 26S and application of the surface 35 on the back of boss 43, so that the latter is applied on the reset pusher 26R. The two pushers are then driven
25 in from a single operation on the stop push-button 12S.

Figure 13 shows in perspective a support variant 50' which does not serve as terminal cover.

The movement of levers 30, 40 in the support could take place in translation instead of in rotation.
30 The invention also applies in the situation where the case only comprises one stop push-button 12 and the thermal relay only one stop pusher 26.



Claims

1. Device for housing and manually controlling a thermal relay (20) associated with a contactor (14), the thermal relay (20) comprising a box (21) with, on a front face (25), a pusher (26S, 26R) with a stop and/or resetting function, the device comprising a case (10) which has on a front wall (11) at least one push-button (12S, 12R) equipped with a thrust element (12a) and which comprises transmission means actuated by the thrust element for actuating the pushers (26R, 26S) of the thermal relay (20), said transmission means comprising at least one transmission element (30, 40) having, on the one hand, a drive surface (33, 43) which can be applied on a pusher (26S, 26R) of the thermal relay (20), and, on the other hand, a receiving surface (34, 44) on which the thrust element (12a) of the push-button (12) is applied, the transmission element (30, 40) being movably mounted in a support (50) fast with the box (21) of the thermal relay (20),

characterized in that

- the thermal relay (20) has a stop pusher (26S) and a reset pusher (26R) and

- the transmission means comprise two transmission elements, namely

. a stop lever (30) having a drive surface (33) which may be applied on the stop pusher (26S) and be acted upon by a stop push-button (12S),

. a reset lever (40) having a drive surface (43) which may be applied on the reset pusher (26R) and acted upon by a reset push-button (12R), the stop lever (30) being adapted for being applied on a portion (45) of the reset lever (40) in order to push in the reset pusher (26R) in response to the actuation of the stop push-button (26S).

2. The device as claimed in claim 1, characterized in that the transmission lever (30, 40) is mounted for pivoting in bearings of the support (50) so as to rotate about an axis (x-x, y-y) parallel to the



plane (P) of the front face (25) of the box (21) of the thermal relay (20), the lever (30, 40) having a receiving surface (34, 44) for the associated thrust element (12a), this surface (34, 44) being offset along the axis (x-x, y-y) with respect to the position of the associated pusher (26S, 26R).

3. The device as claimed in claim 2, characterized in that the transmission levers (30, 40) comprise pivoting bars (31, 41) with parallel axes (x-x, y-y) each offering a receiving surface (34, 44) for the associated thrust element (12a), the receiving surfaces (34, 44) of the two bars (31, 41) being separated in the direction of the axes (x-x, y-y) by a distance a greater than the distance b between the axes of the pushers (26S, 26R).

4. The device as claimed in one of claims 2 and 3, characterized in that the stop lever (30) has an arm (32) which is applicable directly on the stop pusher (26S) and a surface (35) of which is applicable on an arm (42) of the reset lever (40).

5. The device as claimed in claim 4, characterized in that the surface (35) of the arm (32) of the stop lever (30) is divisible.

6. The device as claimed in one of claims 1 to 5, characterized in that the support (50) of the transmission lever (30, 40) is interlocked and/or snap-fitted on the box (21) of the thermal relay (20).

7. The device as claimed in one of claims 1 to 6, characterized in that the transmission lever (30, 40) forms simultaneously a protective cover against touching the terminals (23, 27) of the thermal relay (20).

8. The device as claimed in one of claims 1 to 7, characterized in that the support (50) of the transmission lever (30, 40) comprises openings (53) coinciding with openings (27a) provided for terminals (27) of the thermal relay (20) in the front face (25) thereof.

9. The device as claimed in one of claims 1 to 8,



characterized in that pins (56) for interconnection of a switch of the thermal relay (20) with the coil of the contactor (14) are fixed to the support (50) of the transmission lever (30, 40).

5 10. The device as claimed in claim 9, characterized in that the support (50) of the transmission lever (30, 40) is pre-wired with the contactor (14) before the thermal relay (20) is fixed thereon.

10 11. The device as claimed in one of claims 1 to 9, characterized in that the support (50) of the transmission lever (30, 40) is a cradle which comprises interlocking and/or snap-fitting conformations (54) cooperating with complementary elements (55) on the box
15 (21) of the thermal relay (20) and a front strip (52) having openings (53) coinciding with openings (27a) provided in the front face (25) of the box (21) for the terminals (27) of the thermal relay (20).